Blackinton Bridge (Galvin Road Bridge)
Spanning the Hoosic River on Galvin Road
North Adams
Berkshire County
Massachusetts

HAER No. MA-109

HAER
MASS,
2-ADAMN,
1-

PHOTOGRAPHS
WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Washington, DC 20013-7127

HAER
MASS.
3-ADAMN,
1-

HISTORIC AMERICAN ENGINEERING RECORD

BLACKINTON BRIDGE
(GALVIN ROAD BRIDGE/BAKER BRIDGE)
HAER No. MA-109

| | |
|---|---|
| Location: | Spanning the Hoosic River on Galvin Road, North Adams, Berkshire County, Massachusetts<br>UTM: Williamstown, Mass., Quad. 18/649580/4729320 |
| Date of Construction: | 1884 |
| Structural Type: | Wrought-iron lenticular through truss bridge |
| Engineer: | Unknown; design based on 1885 patent by William O. Douglas |
| Fabricator/ Builder: | Berlin Iron Bridge Company, East Berlin, Connecticut |
| Owner: | Town of North Adams, Massachusetts |
| Previous Use: | Rural vehicular and pedestrian bridge |
| Present Use: | Closed to vehicular traffic |
| Significance: | The Blackinton Bridge is an excellent, virtually unaltered example of William O. Douglas's 1885 patent, which he claimed improved upon his earlier (1878) patent for a lenticular truss bridge. The construction date suggests that the Blackinton Bridge may have been one of the first to incorporate the features of Douglas's second patent, including floor-line tension chords and strut braces. The bridge was fabricated and erected by one of New England's most prolific iron bridge builders, the Berlin Iron Bridge Company. Between 1878 and 1895, the company erected well over 600 lenticular trusses in New England and Upstate New York. The Blackinton Bridge is one of approximately fifty lenticular truss bridges to survive nationally, and one of only ten known surviving lenticular truss bridges in Massachusetts (eight of which are under Massachusetts Department of Public Works purview). |
| Project Information: | Documentation of the Blackinton Bridge is part of the Massachusetts Historic Bridge Recording Project, conducted during the summer of 1990 under the co-sponsorship of HABS/HAER and the Massachusetts Department of Public Works, in cooperation with the Massachusetts Historical Commission. |

Patrick Harshbarger, HAER Historian, August 1990

Description

The Blackinton Bridge spans the Hoosic River at Galvin Road several miles west of downtown North Adams. To the north of the bridge, worker's homes line Massachusetts Avenue, on the western edge of the nineteenth-century manufacturing village of Blackinton. A branch of the Boston & Maine Railroad parallels the river's northern bank and crosses Galvin Road at grade approximately 30' north of the bridge. To the bridge's south is a twentieth-century residential neighborhood. Both banks of the river are heavily wooded. The Blackinton Bridge is a single-span, seven-panel lenticular through truss. Parabolic upper and lower chords characterize the lenticular form. Because of their distinctive shape, such bridges are often referred to as "pumpkinseed bridges." The Blackinton Bridge is 103' long and 16' wide. The distance from the bottom chord to the river is approximately 12' to 15'. The depth of the structure varies from 9' at the portal ends, to 18' at the center. Each truss panel measures approximately 14'-9" in length.(See Figures 1-3.)

The segmental upper chord is riveted together at each panel point. Each segment is comprised of three plates and four angles in the form of an inverted trough, 16"x8". A single lacing system connects the angles at the bottom of the section. The lower chord is comprised of paired wrought-iron eyebars, measuring 1"x3". The lower chord segments are pinned together at each panel point. The endposts are similar in form to the upper chord. The bases of the endposts rest directly upon the coursed granite abutments. The upper chord and the endposts are pinned together, and the connection is wrapped with a plate; the lower chord's eyebars are pinned through the riveted L-shaped side plate. The vertical web members are paired wrought-iron angles joined by lattice work. The main diagonals are single 1½"-diameter wrought-iron rods.

A "tension floor-line chord," in the form of a wrought-iron rod, runs the length of the truss, and is bolted to the foot of each endpost and the floor beams. The floor-line chord measures 1½" in diameter.[1]

The foot of the endpost is connected with the first lower panel point in each truss by means of a strut-brace. The strut braces measure 15'-3" in length. The are made like the verticals, and consist of paired wrought-iron angles joined by lattice work.

A mid-height stiffening rod connects the four center verticals of the truss and then angles upwards to connect with the upper chord. The rod is ¾" in diameter and has adjustable turnbuckles.

The floor beams taper, their deepest point at the center of the bridge and their shallowest at the exterior edges. The floor beams hang from the lower-chord panel points by means of U-shaped rods passing over the connecting pins. The lower lateral rods connect to the floor beams by bolts. The plank deck roadway rests on timber stringers. A cable guardrail, connected to the verticals by specially-fitted eyelets, is probably original to the bridge.

The upper lateral struts are two pairs of angles, toed in, connected with double lacing. The portal struts have a greater depth than the struts at the other panel points. Knee braces stiffen all of the upper lateral struts. The truss also has upper lateral cross-bracing.

Lenticular Bridges

A number of amateur and professional historians have written about the history of lenticular bridges. The lenticulars' association with a single manufacturer (the Berlin Iron Bridge Company), their predominance in a relatively small geographic region (New England and Upstate New York), and their aesthetically-pleasing form, have made the lenticular truss a popular subject among bridge enthusiasts. Between 1878 and 1895, the Berlin Iron Bridge Company built well over 600 lenticular bridges in the Northeast. At least fifty of these trusses have survived to the present.

The Blackinton Bridge is one of approximately fifty lenticular truss bridges to survive nationally, and one of only ten known surviving lenticular truss bridges in Massachusetts (eight of which are under Massachusetts Department of Public Works purview). Built in 1884, the Blackinton Bridge is a rare example of a structural type that once predominated among the iron truss bridges of Western Massachusetts.[2]

Lenticular trusses came in a veriety of sizes and configurations. They ranged from 20' to over 200' in length, and could be designed as either pony, through, half-through, or deck trusses--although through and pony trusses were by far the most popular forms.

When the Corrugated Metal Company, the forerunner of the Berlin Iron Bridge Company, began building trusses in the late 1870s, the lenticular form had already been known for a number of years. Lenticular trusses had been built in 1840 in France, in 1857 in Cermany, and in 1859 in England. Patents for bridges of the lenticular form had been granted in the United States to Edwin Stanley in 1851, and to Horace Hervey and Robert Osborne in 1855.[3]

Considering thses early bridges and patents, historians have considered it odd that the United States Patent Office granted William O. Douglas a patent for a lenticular truss in 1878.(See appendix.) Douglas was a West Point graduate and a diabled veteran of the Civil War. He had spent some time in the Reconstruction government of Texas and moved back to his hometown, Binghamton, New York, to open a hardware business, which after a short period failed. In 1878, Douglas took out a patent on a lenticular truss and entered into business with the Corrugated Metal Company of East Berlin, Connecticut. It is not known where Douglas received the inspiration for his patent, although he may have been exposed to its principles in engineering classes at the military academy. Bridge historian Victor Darnell believes that Douglas developed his ideas without any knowledge of European usage of earlier American patents.[4]

Berlin Iron Bridge Company

The Corrugated Metal Company had descended from a series of firms that had specialized in tinner's tools and machines, and corrugated iron for buildings. when an entrepreneur named S.C. Wilcox took over the firm in 1877, it was on the verge of bankruptcy. Wilcox reorganized the company, obtained the rights to Douglas's bridge patent, and began building lenticular trusses. In 1883, Wilcox renamed the enterprise the Berlin Iron Bridge Company.[5]

In the late-nineteenth century, dozens of engineers and companies experimented with a wide variety of bridge designs. Most of the new trusses proved economically unfeasible, or lacked strength and durability. The success of the Berlin Iron Bridge Company was unusual and relied upon a combination of marketing savvy, engineering skill and luck. The firm specialized in highway bridges and salesmen aggressively pursued contracts with nearby towns that were just beginning to replace older wooden bridges with iron spans. With lower transportation and erection costs, the company could underbid many of its competitors from Boston, New York, and Philadelphia. Guided by Wilcox's entrepreneurial skill, the Berlin Iron Bridge Company's product, marketing technique, and price, were designed to appeal to the selectmen and bridge committees in charge of purchasing bridges for New England towns.[6]

In the 1870s a new iron truss bridge of substantial length cost little more than a new wooden bridge. When it came time to replace an older bridge that had been washed away in a flood or had simply worn out, a town's citizens often chose to buy an iron truss rather than to continue the tradition of hiring local craftsmen to erect a wooden trestle or covered bridge.

## Blackinton Bridge

A wooden bridge had probably spanned the Hoosic River at the site of the Blackinton Bridge since the late-eighteenth or early-nineteenth century. The local citizens referred to the crossing as Baker Bridge, named after Dr. Elisha Baker, a nearby resident, and a hero of the Revolutionary War's Battle of Bennington (1777).[7]

In 1801 Otis Blackinton purchased the land northeast of the bridge and started a small farm. Otis's son Sanford apprenticed to a local woolen mill, and in 1822 began his own textile factory along the Hoosic River on his father's land.(See Figure 4.) The enterprise proved successful, and according to a local historian, "around the factory and the single house which stood near it at the beginning, grew up the village of Blackinton, whose population has largely been made up of mill operatives."[8] By 1876, the Blackinton Mills employed 300 hands and operated 50 broad looms and 36 narrow looms, producing 50,000 yards of fancy cassimeres per month. The town seems to have been typical of paternalistic mill villages in New England. Sanford Blackinton provided a church, school, general store, and housing for his workers.

The growth of industry along the Hoosic River affected the political boundaries of the nearby towns. In 1878 North Adams, the center of industrial activity (and, up to that point, an unincorporated village), separated from the rural town of Adams to the south. Blackinton straddled the boundary between North Adams and Williamstown, the western half of the village resting in the latter. Williamstown, although home to a number of mills, also had a diverse agricultural economy and was the site of Williams College. Apparently, a number of Williamstown's citizens considered the care and maintenance of roads and bridges in Blackinton a nuisance, and in 1893 the town ceded the western half of the mill village to North Adams.[9] Consequently, the maintenance and care of the Blackinton Bridge on the edge of the village fell to Williamstown until 1893, and North Adams thereafter. The Williamstown records on the bridge are spotty because of a fire that destroyed the town hall in the 1870s. Apparently, the bridge had been completely rebuilt in 1845 at a cost of $700, paid to a local bridge builder named Temple Monroe. No records of repairs to this bridge could be located.[10]

On May 29, 1884, the North Adams Transcript reported that the Williamstown selectment had held a special town meeting to take action on the rebuilding of the Blackinton Bridge which had burned sometime that spring. After considerable discussion, the citizens had decided to build an iron bridge, not to exceed the cost of $3500. The selectmen formed a bridge committee to take charge of the building of the bridge.[11]

Bridge committees usually announced their intentions to let a bridge contract in the local newspaper, or contacted the local agents of bridge manufacturers. On an appointed day, the agents would gather at the town hall and present their companies' proposals. After examining the various proposals, the Williamstown bridge committee awarded the contract to the Berlin Iron Bridge Company, with a bid of $1925.[12]

Typically, the bridge manufacturer took responsibility for erecting the bridge, and the town took responsibility for repairing or building the abutments and piers. The cost of stone and masonry could often exceed the expense of the iron truss itself. In the case of the Blackinton Bridge, Williamstown spent $1,400 on two new 11'x14' coursed stone abutments, sunk below the riverbed.[13]

Bridge construction at Blackinton met with a number of delays. On July 17, 1884, the newspaper reported that work at the bridge had come to a standstill while the workmen waited for stone to arrive via the Troy & Boston Railroad. Waxing somewhat meodramatic, the reporter continued, "In the meantime the travelling public must suffer and wait and hope." By September the Berlin Iron Bridge Company's erection crew had arrived at the site, but the first attempts to lay a falsework went awry when an unexpected freshet carried off the timers and iron rods. The newspaper estimated that the flood cost the contractors $300 in material.[14]

Still, the Berlin company prided itself in quick and efficient work. During the summer, up to thirty erection teams travelled the Northeast, building each new lenticular bridge in a matter of weeks. On September 25, 1884, the Berlin crew finished the Blackinton Bridge. The total cost including abutments was $3,361.17.[15]

Two unusual features of the Blackinton Bridge are the "tension floor-line chords" that run between endposts on opposite banks, and the "strut-braces" that connect the footings to the second panel point of the lower chord.(See Appendix A.) The Berlin Iron Bridge Company probably had begun adding the floor-line chords and strut-braces to some of its bridges in 1884. Douglas applied for a patent for the floor-line chord in October of that year, stating that it resisted the effect of the wind of other forces acting laterally against the bridge. Douglas hoped that the floor-line chord, in combination with the inclined struts, floor beams, the lower lateral rods would act as a "wind truss," and lessen the cost of bridge construction by reducing the amount of material required for heavier members.[16]

The Blackinton Bridge has been identified in the Massachusetts Department of Public Works database as the only one of three remaining lenticular through truss highway bridges that incorporates the floor-line chord and strut-braces patented by Douglas in 1885.[17] Bridge historian Victor Darnell is skeptical that the wind truss served much of a structural purpose, and in fact, claims that the improvement may have actually reduced the truss's lateral stiffness. Darnell estimates that only about one-third of the Berlin trusses built after 1885 made use of Douglas's second patent.[18]

By the mid-1890s, most of New England's wooden bridges had been replaced, and the Berlin company's business dwindled. The firm phased out the lenticular design in favor of the more heavily-constructed Warren trusses. Although the firm hired salesmen in the Midwest, the cost of transportation probably prevented the firm from effectively competing against other bridge manufacturers, and eventually, the company shifted its emphasis to metal-frame factory and mill buildings. In 1900 Berlin Iron Bridge Company, along with twenty-five other regional bridge companies, merged with the American Bridge Company.[19]

The age of the automobile marked the beginning of the end for the lenticular trusses. Not only did the Berlin company stop making the aesthetically-pleasing bridges, but many towns found that their bridges proved inadequate to the increased volume of heavier and faster vehicles. Berlin had built few trusses wider than 16', and fast-moving cars needed wider clearances; a number of these narrow bridges met their end when an automobile or truck rammed the endpost. Throughout the twentieth century, steel and concrete bridges replaced the beautiful lenticulars.[20]

## Conclusion

The Blackinton Bridge, located on a less-traveled byway, remained open until 1980 when engineers closed the bridge because of structural weakness. In 1981 the local newspaper reported that the Massachusetts Department of Public Works planned to tear down the truss, but that the Massachusetts Historical Commission had judged it worthy of nomination to the National Register of Historic Places. The North Adams Historical Commission (NAHC) proposed moving the bridge to the site of the North Adams Heritage Park. All of the parties involved agreed to moving the bridge, but no money could be found to fund the project. The NAHC still hopes to be able to save the bridge from demolition, and is currently considering its inclusion in the plans for a modern art museum in North Adams.[21]

Over the years, repairs to the Blackinton Bridge have been minimal. The town has replaced the timber stringers and plank decking, but no alterations to the trusses themselves are evident. The Blackinton Bridge is an outstanding example of the lenticular trusses that were once the most numerous type of iron highway bridges in Western Massachusetts.

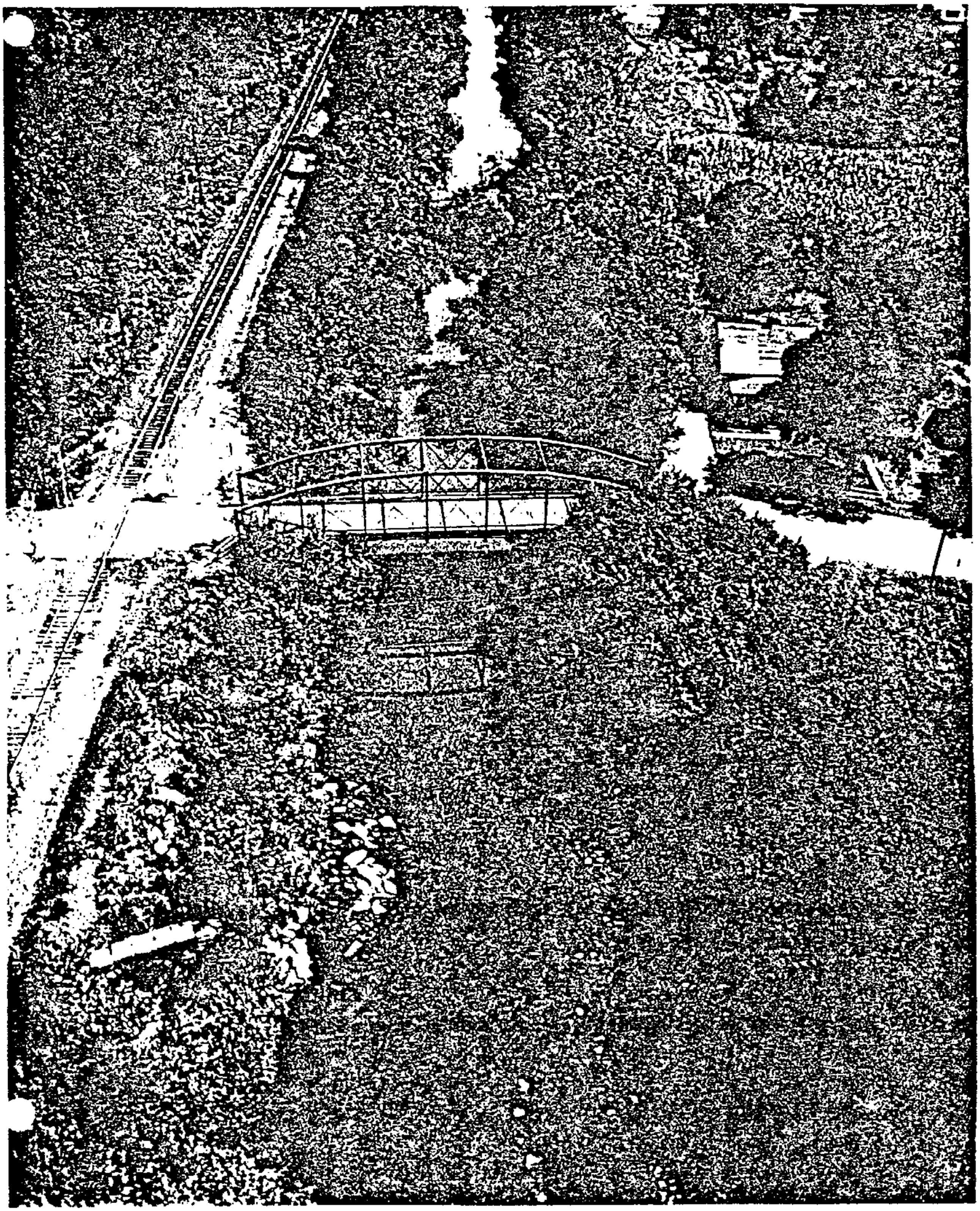

FIGURE 1: Blackinton Bridge, c.1980. (Photo courtesy of MDPW.)

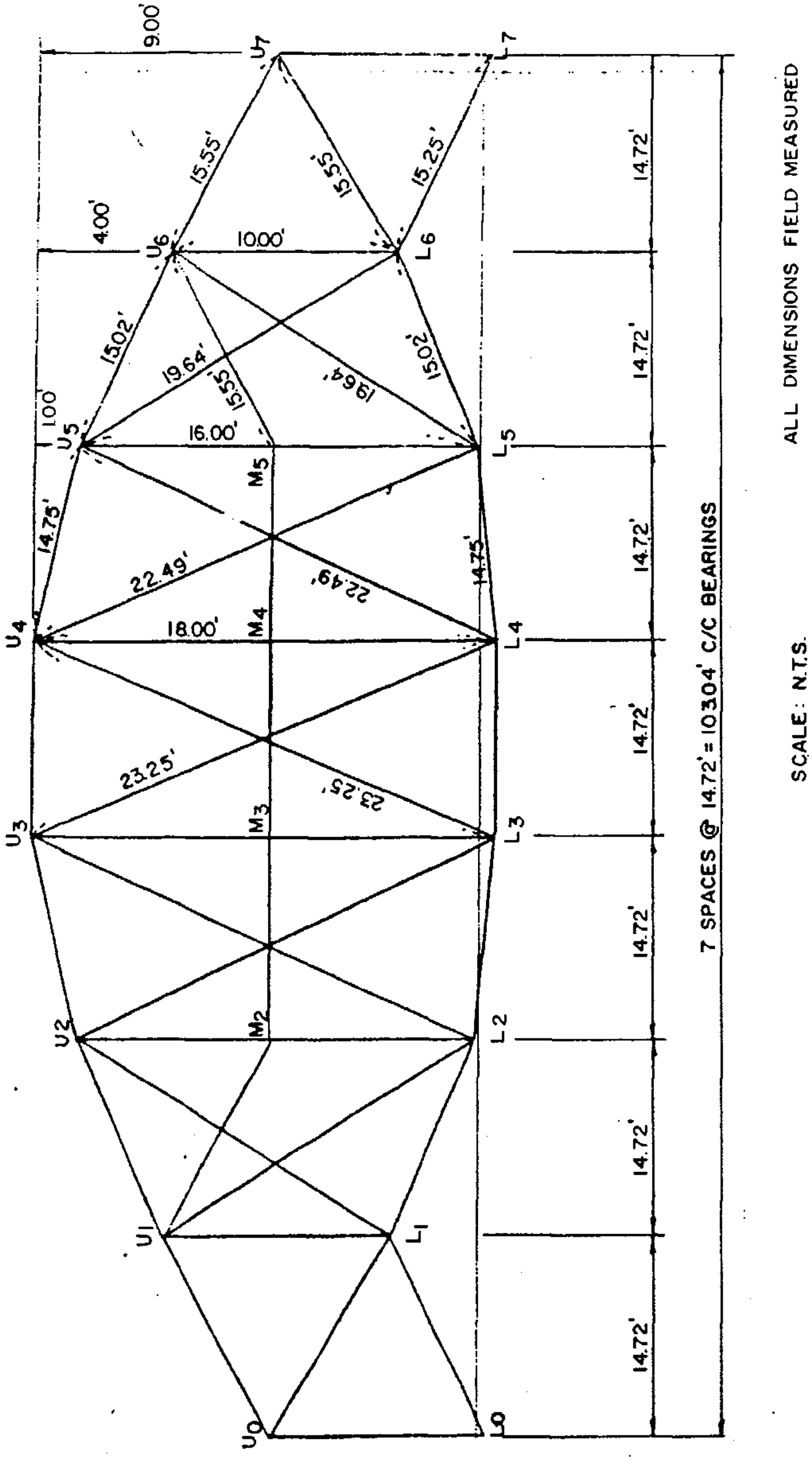


FIGURE 2: Blackinton Bridge Truss Geometry.
("Bridge #N-14-2," MDPW Bridge Section files.)

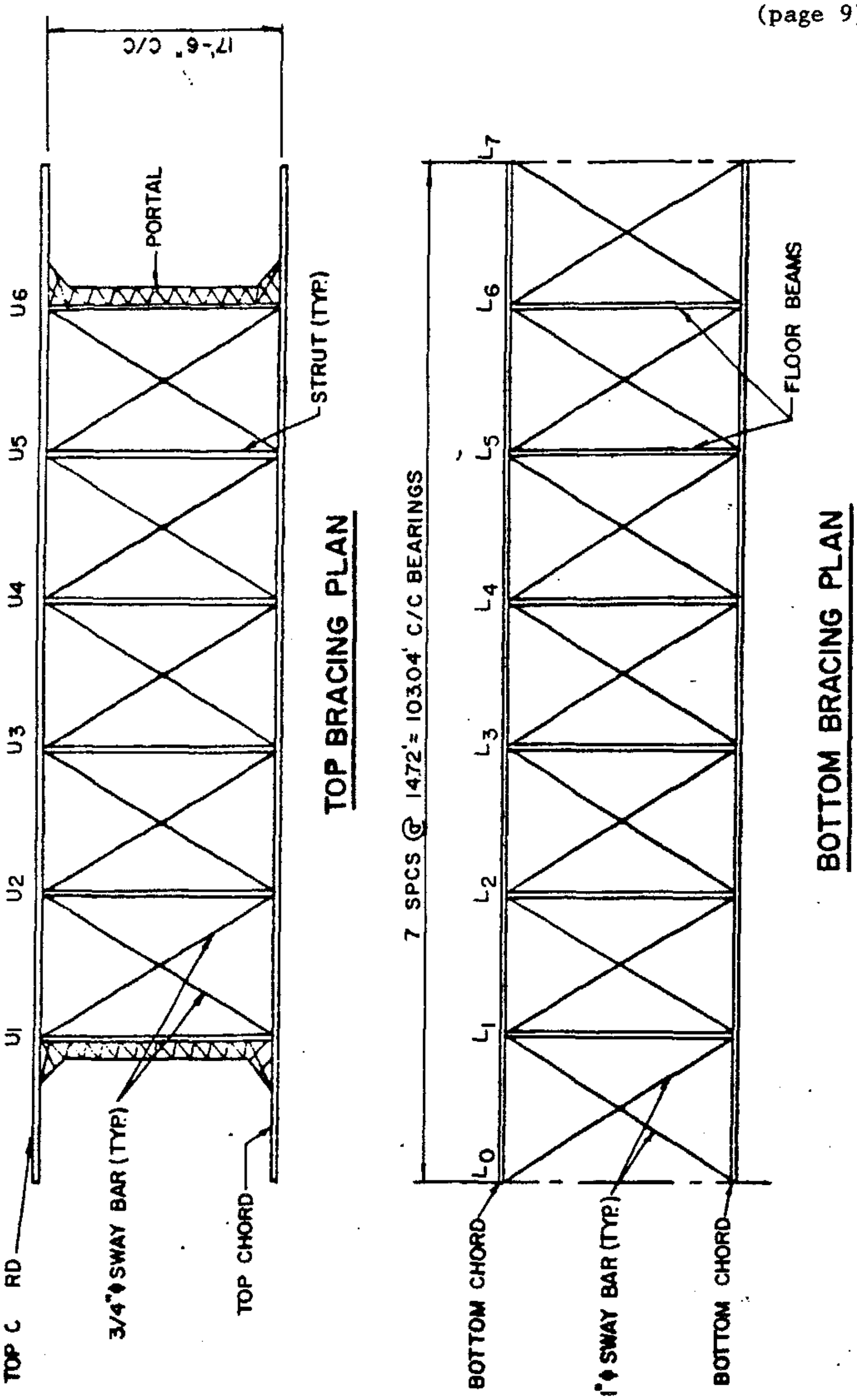


FIGURE 3: Blackinton Bridge Bracing Plan.
("Bridge #N-14-2," MDPW Bridge Section files.)

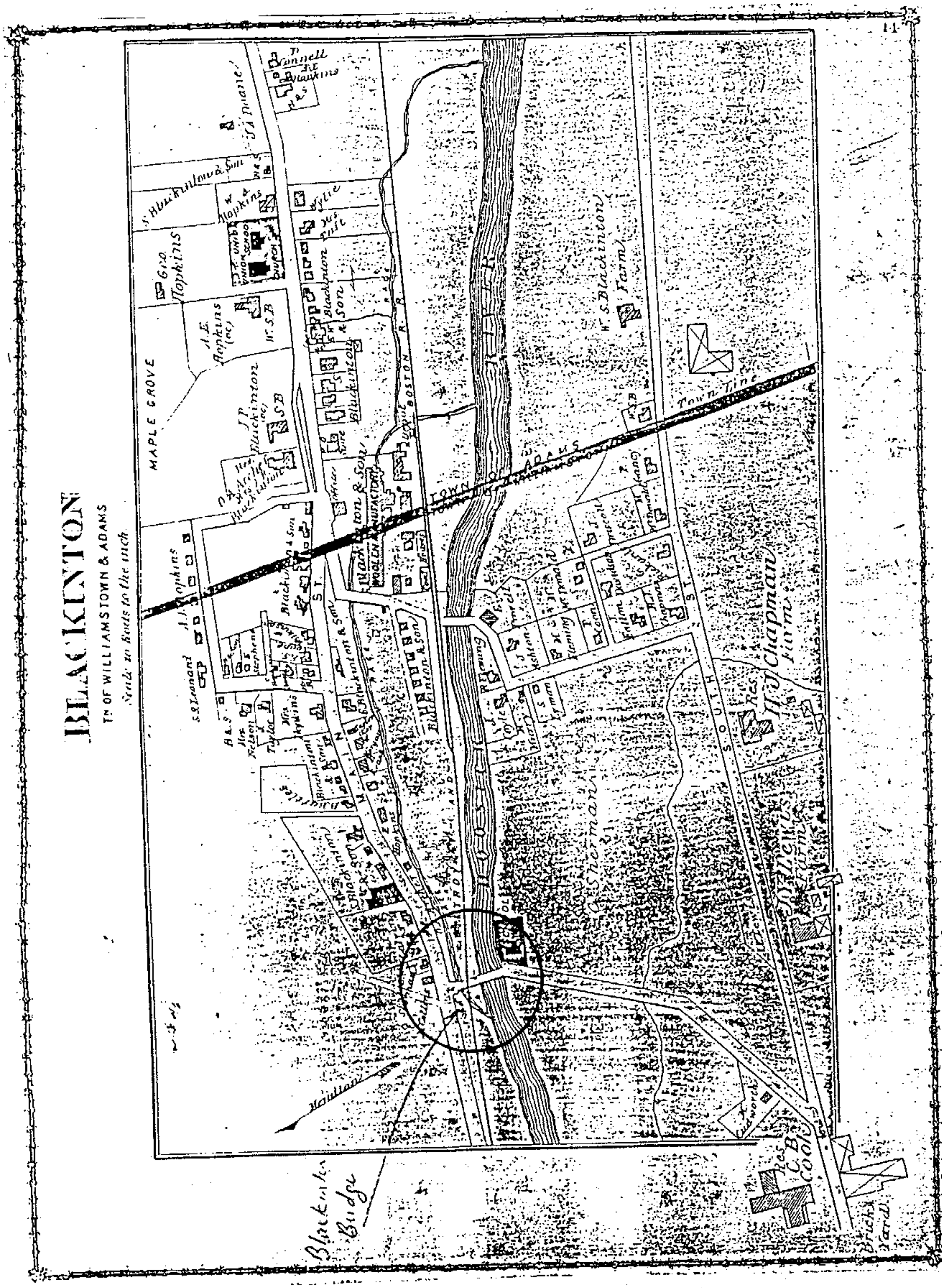


FIGURE 4: Map of Blackinton Village, 1876.
(North Adams State College Library, North Adams, Massachusetts.)

# UNITED STATES PATENT OFFICE.

WILLIAM O. DOUGLAS, OF BINGHAMTON, NEW YORK.

## BRIDGE.

SPECIFICATION forming part of Letters Patent No. 315,259, dated April 7, 1885.

Application filed October 17, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM O. DOUGLAS, a citizen of the United States, residing at Binghamton, in the county of Broome and State of New York, have invented certain new and useful Improvements in Bridges, of which the following is a description.

A very important factor in bridge construction is the means employed to resist the effect of the wind or other force acting laterally on a truss. This is especially true in long spans where the conditions are such that the distance between the trusses of a bridge is limited. In the case of a parabolic truss this wind-truss is a very important factor in the construction of a bridge, requiring in long spans with narrow roadway a large amount of material because the chords or flanges of the wind-truss have been heretofore designed to resist both compression and tension, the leeward chord being in tension and the windward chord being in compression alternating upon the chords in character or kind of strain according to the direction of the wind or other force applied laterally.

My invention is designed to improve this condition of things in parabolic truss-bridges to the end of cheapening the cost of the bridge both in the amount of material and cost of construction and increasing its efficiency by providing a means by which both flanges of the wind-truss shall be always in tension, which is done by providing the brace A to resist the pull of the chords B in a parabolic truss.

Figure I represents an outline diagram in elevation of a parabolic truss. Fig. II represents an outline diagram of a floor-plan of the same. Fig. III represents an enlarged view of the end panel and part of the second panel of the truss shown in Fig. I, in which D represents the top chord of the supporting-truss; E, the bottom chord; C, the end post; F, the first web-post; G, the first web-tie; H, the suspender; B, the tension floor-line chord, and A the end brace-strut, all hereinafter described, and in different figures represented by the same letters.

Referring to Fig. III, A is the diagonal strut, extending from the first panel-point of lower chord to a pin near base of end post, to which same pin the tension floor-line chord B attaches. The strut A might extend from base of end post to second panel of lower chord, to first or second panel of upper chord, or to any convenient point in the supporting-truss in such a manner as to make a stiff fixed member to resist the pull arising from the tension floor-line chord B; but it is preferred as represented. In short spans less than about seventy-five feet the brace or strut A may be omitted, the tension floor-line chord being secured at the end post by a bolt in the masonry.

Fig. IV represents a detail side and sectional elevation of the first panel-point of the lower chord, showing lower chord, E, first web-post F, web-tie G, suspender H, and the diagonal strut-brace A, all connected at panel-point by pin I.

Fig. V represents a detail side and sectional view of base of end post, C, resting on a nest of rollers and connected with the diagonal strut-brace A and the tension floor-line chord B by means of a pin passing through the three pieces R.

Fig. IV represents a brace between the end posts to keep them from drawing together under the tension of sway-rods J.

Figs. VI and VII represent the connection of tension floor-line chord B with floor-beam K and sway-rod J. In Fig. VIII the same connection is shown for a bridge askew with the abutments. In all of the above figures the connections are by means of pins; but I do not confine myself to the use of pins alone in the connections; but my invention would be the same if the connections were made by rivets or otherwise. The forms of the different parts as represented are those generally used in the parabolic truss; but these forms may be changed to suit the different conditions or different details of construction.

In a separate application of even date herewith I have shown, described, and claimed the tie-rod B in connection with the rods J and floor-beams K, forming a lower lateral wind-truss; and I therefore make no broad claim to that feature in this case.

What I claim as my invention is—

The combination of a tension floor-line chord, B, with a strut-brace, A, or its described equivalent in a parabolic truss-bridge, whereby a point in the end post is fixed so rigidly as to resist the pull of the chords B, making both flanges of the wind-truss always in tension, substantially as illustrated and described.

WILLIAM O. DOUGLAS.

Witnesses:

F. J. BAYLESS.

CHAS. D. MATTHEWS.

(No Model.) 4 Sheets—Sheet 1.

# W. O. DOUGLAS.

BRIDGE.

No. 315,259. Patented Apr. 7, 1885.

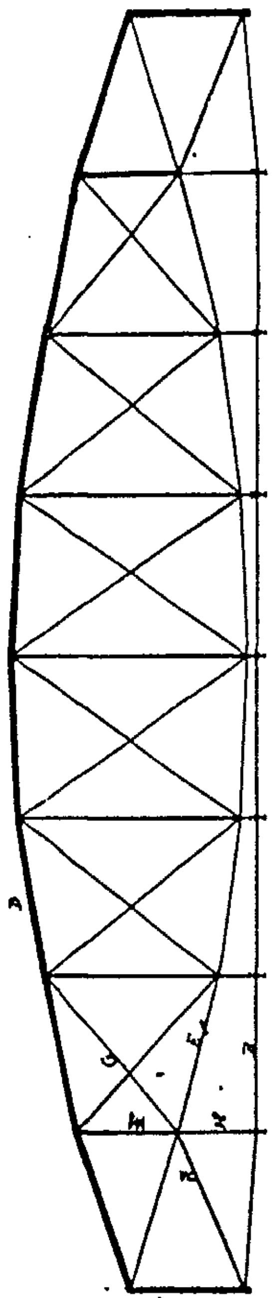

FIG. I

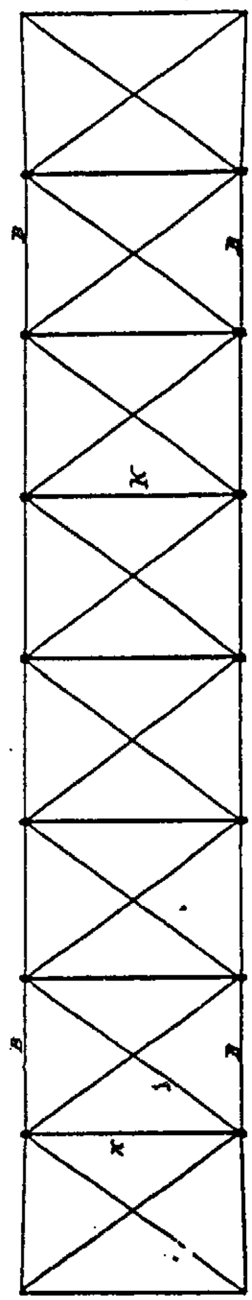

FIG. II

WITNESSES:

Edw. W. Byrn
Harrison R. Brown

INVENTOR:

Wm. O. Douglas
BY Munn & Co
ATTORNEYS.

(No Model.)

4 Sheets—Sheet 2.

W. O. DOUGLAS.

BRIDGE.

No. 315,259. Patented Apr. 7, 1885.

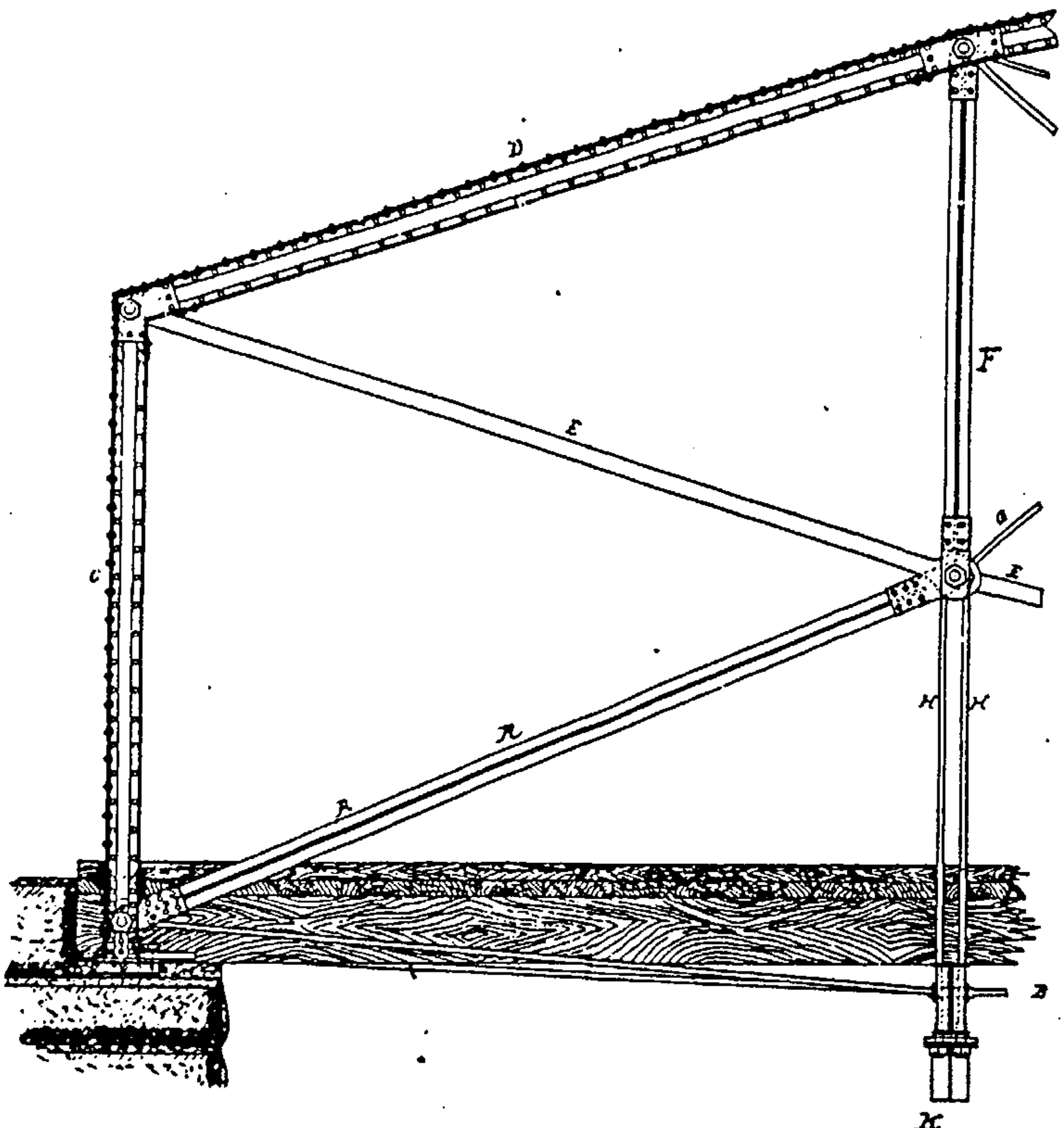


FIG. III

WITNESSES:

Edw. W. Byrn.
Harrison R. Brown

INVENTOR:

Wm O. Douglas

BY Munn & Co

ATTORNEYS.

BLACKINTON BRIDGE
(GALVIN ROAD BRIDGE/
BAKER BRIDGE)
HAER No. MA-109
(page 15)

(No Model.) 4 Sheets—Sheet 3.

W. O. DOUGLAS.

BRIDGE.

No. 315,259. Patented Apr. 7, 1885.

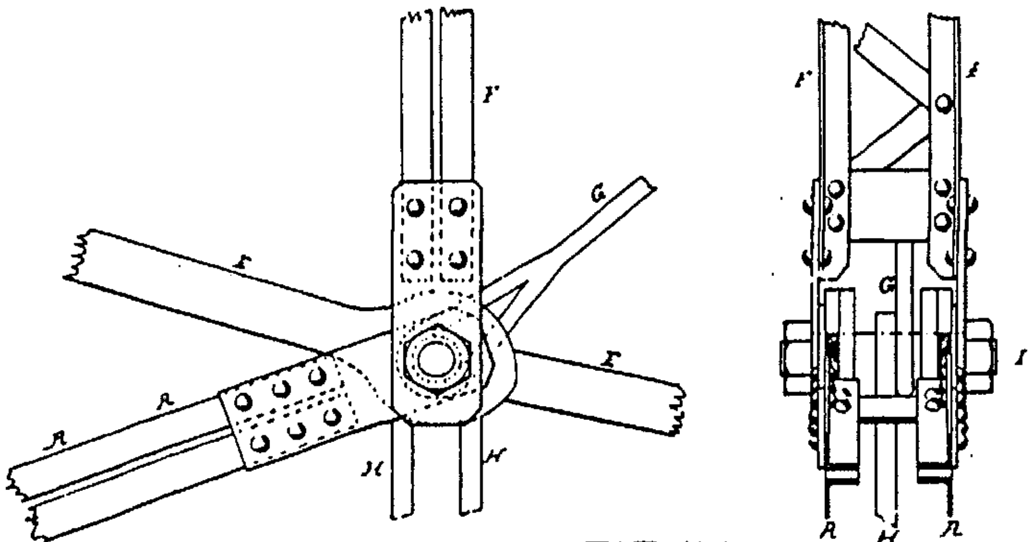

FIG. IV

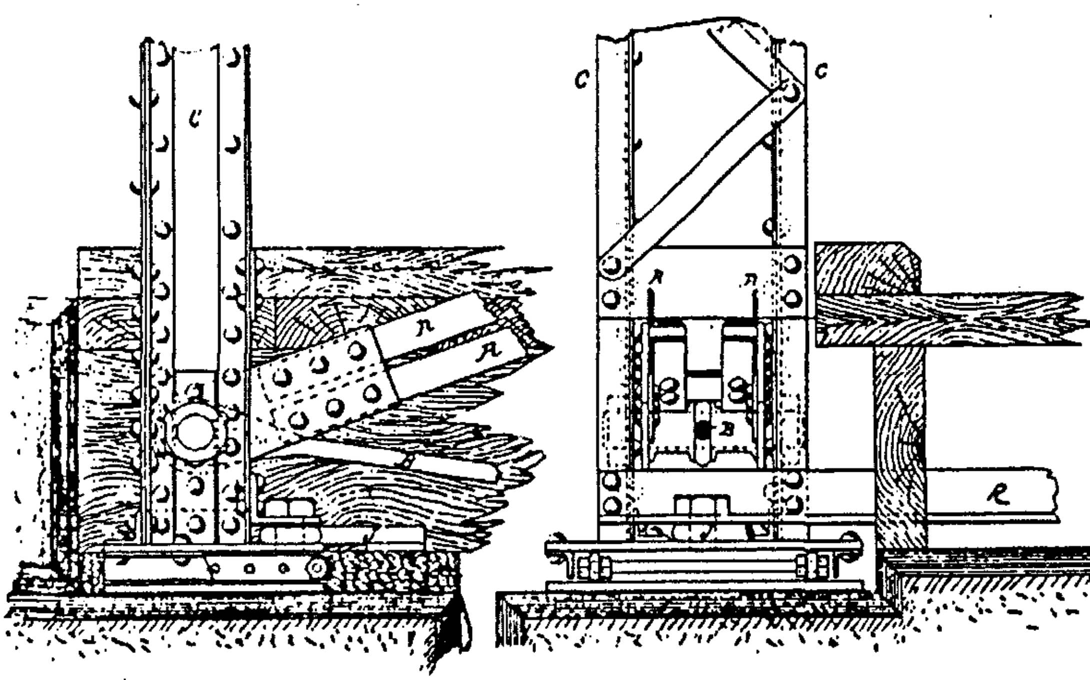

FIG. V

WITNESSES:

Edw. W. Byrn
Harrison B. Brown

INVENTOR:

Wm. O. Douglas

BY Munn & Co

ATTORNEYS.

(No Model.) 4 Sheets—Sheet 4.

W. O. DOUGLAS.

BRIDGE.

No. 315,259. Patented Apr. 7, 1885.

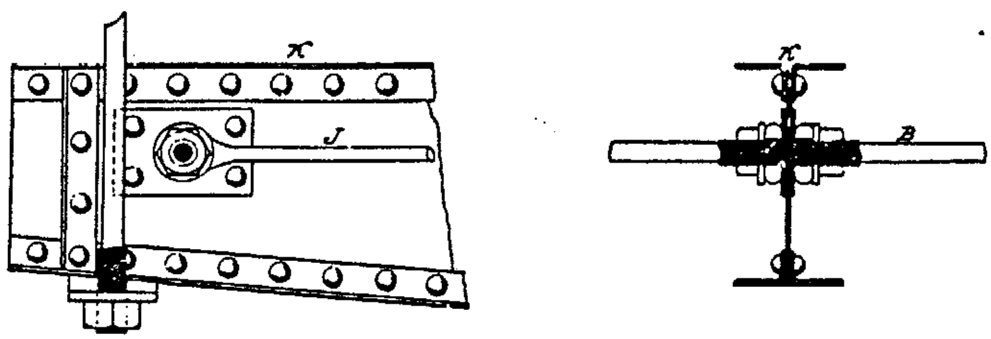


FIG VI

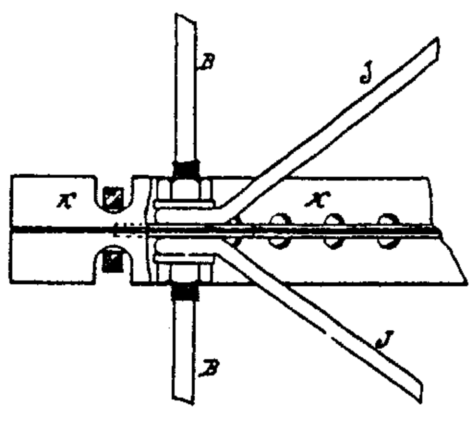


FIG VII

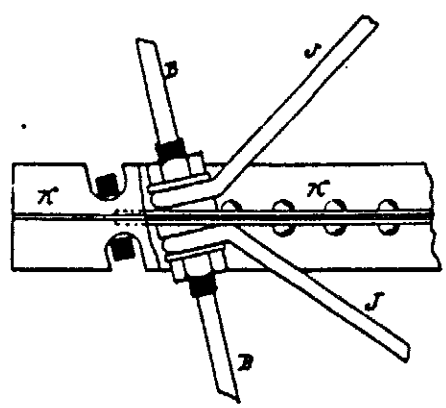


FIG VIII

WITNESSES:

Edw. W. Byrn.

Harrison G. Brown

INVENTOR:

Wm. O. Douglas

BY Munn & Co

ATTORNEYS.

ENDNOTES

1. In his 1885 patent (No. 315,259), William O. Douglas calls this feature a "tension floor-line chord," and the combination of floor-line chords, strut-braces, floor beams, and lower lateral rods, a "wind-truss." More information about the Douglas patent is given in the history section of this report.

2. The 1990 Massachusetts Historic Bridge Recording Project documented three other lenticular bridges: Bardwell's Ferry Bridge at Conway/Shelburne, 1882 (HAER No. MA-98); Tuttle Bridge at Lee, 1885 (HAER No. MA-105); and Aiken Street Bridge at Lowell, 1883 (HAER No. MA-106).

3. Darnell, p.19.

4. Darnell, pp. 19 and 27; Drew, pp. 17-19; and, Carl W. Condit, American Building Art: The Nineteenth Century (New York: 1960), pp. 124-27.

5. Darnell, p. 24.

6. Condit, p. 103; Darnell, pp. 20-24; and Drew, pp. 17-21.

7. Sandra E. Constantine, "Galvin Road Bridge Linked to Revolutionary War Figure," The Transcript, 7 March 1981, p. 12.

8. Rollin Hillyer Cooke, Historic Homes and Institutions and Genealogical and Personal Memoirs of Berkshire County, Massachusetts (New York: Lewis Publishing Co., 1906), p. 459.

9. W.F. Spear, History of North Adams, 1749-1885 (North Adams, Massachusetts: Hoosac Valley News Printing House, 1885), pp. 71-4; Hamilton Child, Cazetteer of Berkshire County, Massachusetts, 1725-1885 (Syracuse, New York: Hamilton Child, 1885), pp. 248-251; Charles H. Passons, et. al., North Adams, Massachusetts: The Tunnel City (North Adams, Massachusetts: North Adams Board of Trade, 1895), pp. 7, 11, 85-6; and Cooke, Historic Homes and Institutions, pp. 457-60.

10. Records of the Williamstown Town Clerk, Book C, p. 155, Williamstown Town Hall, Williamstown, Massachusetts.

11. North Adams Transcript, 29 May 1884, Collection of the North Adams State College Library, North Adams, Massachusetts.

12. North Adams Transcript, September 25, 1884.

13. Ibid.

14. North Adams Transcript, July 17 and September 25, 1884.

15. North Adams Transcript, September 25, 1884 and March 19, 1885.

16. Darnell, p. 20.

17. Tuttle Bridge (HAER No. MA-105), a lenticular pony truss, has the floor-line chord but lacks the strut-brace. It is the only one of five known surviving lenticular pony truss bridges in the MDPW Historic Bridge Inventory to incorporate this feature.

18. Darnell, p. 20; and S.J. Roper, Massachusetts Historic Bridge Inventory, MDPW, February 9, 1987.

19. J.A.L. Waddell, Bridge Engineering (New York: John Wiley & Sons, 1916), p. 474; Darnell, p. 27; and Drew, pp., 20-21.

20. Drew, pp. 19-20.

21. Constantine, p. 12; and Audrey Sweeney, telephone conversation with author, July 9, 1990.

## BIBLIOGRAPHY

Child, Hamilton, compiler. Gazetteer of Berkshire County, Mass., 1725-1885. Syracuse, New York: Journal Office, 1885, pp. 248-251.

Condit, Carl W. American Building Art: the Nineteenth Century. New York, 1960.

Constantine, Sandra E. "Galvin Road Bridge Linked to Revolutionary War Figure," The Transcript, 7 March 1981, p. 12.

Cooke, Rollin Hillyer. Historic Homes and Institutions and Genealogical and Personal Memoirs of Berkshire County, Massachusetts. New York: Lewis Publishing Company, 1906, p. 459.

Darnell, Victor C. "Lenticular Bridges From East Berlin, Connecticut," The Journal of the Society for Industrial Archeology, vol. 5, no. 1, 1979, pp. 19-32.

Douglas, William O. "U.S. Patent No. 202,526," April 16, 1878.

Douglas, William O. "U.S. Patent No. 315,259," April 7, 1885.

Drew, Bernard. Spanning Berkshire Waterways. Great Barrington, Massachusetts: Attic Revivals Press, 1990.

North Adams Transcript, North Adams, Massachusetts, 1884-85. Collection of the North Adams State College Library, North Adams, Massachusetts.

Passons, Charles H., et. al. North Adams, Massachusetts: The Tunnel City. North Adams, Massachusetts: North Adams Board of Trade, 1895.

Records of Williamstown, Massachusetts. Williamstown Town Hall, Williamstown, Massachusetts.

Spear, W.F. History of North Adams, 1749-1885. North Adams, Massachusetts: Hoosac Valley News Printing House, 1885, pp. 71-74.

Waddell, J.A.L. Bridge Engineering. New York: John Wiley & Sons, 1916.